



EVALUATING DRINKING WATER QUALITY BENEFITS

FTDCCTDF Technical Team

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Presentation Outline



- What are drinking water quality issues?
- How should we evaluate and compare drinking water benefits of proposed projects?





What are drinking water quality issues?





Drinking Water Quality Concerns



- Health:
 - Acute Health Effects: Bacteria, Viruses, Pathogens
 - Chronic Health Effects: Chemicals, Minerals, Salts
- Aesthetics:
 - Taste and Odor: Nutrients, Disinfectant residuals, Salt
 - Hardness
- Usability:
 - Corrosiveness (destructive to distribution system)
 - Hardness (surfactant performance)
 - Salt (industrial processes, general usability)





Drinking Water Treatment



- Physical Removal of Particles
 - Filtration
 - Flocculation/Sedimentation
- Chemical Disinfection
 - Before, during, and/or after
 - Residual requirements
 - Also taste and odor control
- Redundancies





Drinking Water Conveyance





CALFED Drinking Water Quality Goals



- Provide safe, reliable, and affordable drinking water.
- Protect and improve source to tap drinking water quality
 - 50 $\mu\text{g}/\text{L}$ bromide and 3 mg/L total organic carbon at Delta drinking water intakes or equivalent level of public health protection (ELPH)
- Continuous improvement of in-Delta water quality





Drinking Water Constituents of Concern



- bromide
- organic carbon
- pathogens
- nutrients
- salinity
- turbidity
- taste and odor
- emerging contaminants





Multiple Barrier Principle



Source Protection



Treatment Effectiveness

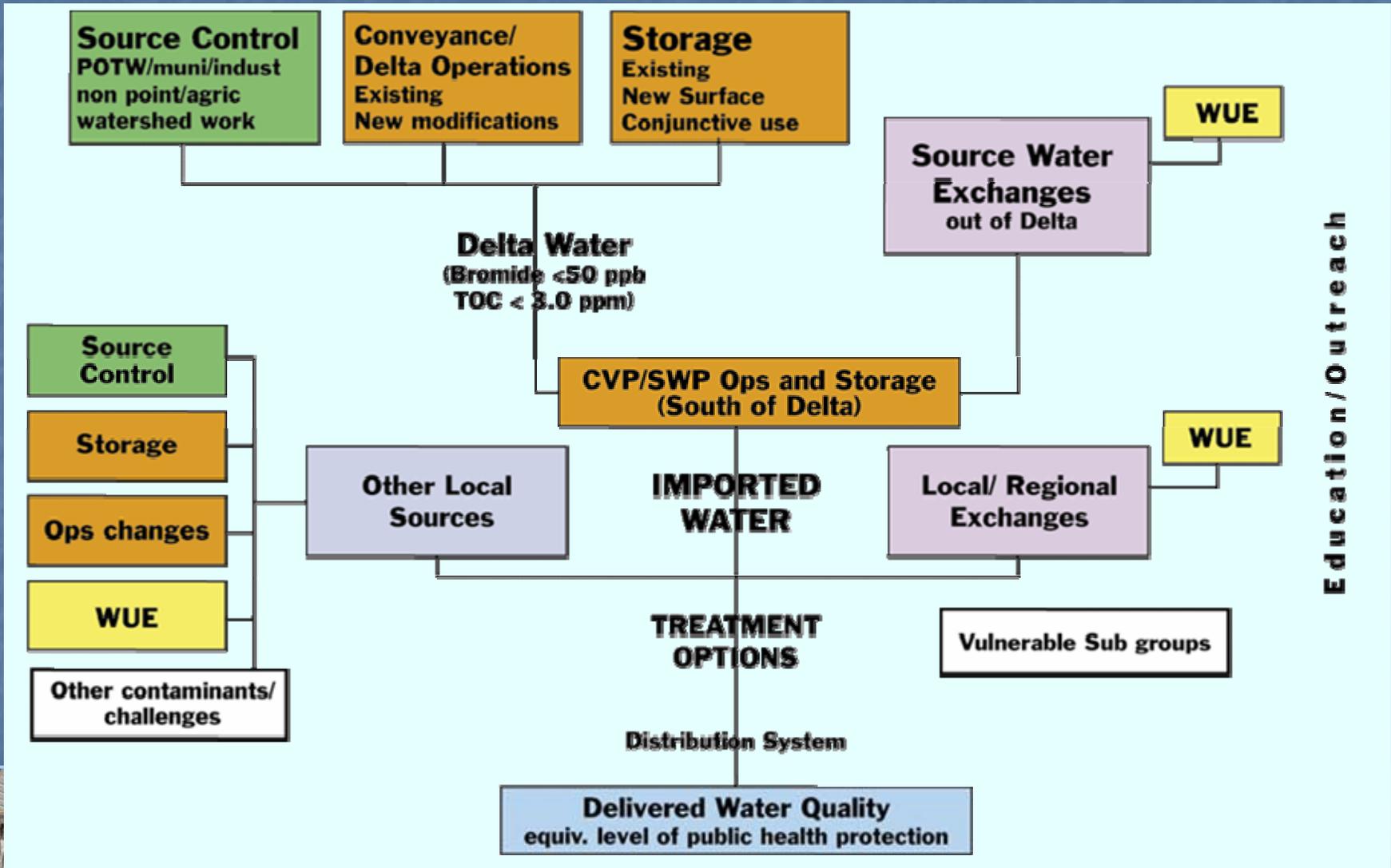


Distribution Integrity





“Equivalent Level of Public Health Protection”



Seasonality

- Concentrations of constituents of concern are strongly seasonal
- But benefits can be important in all seasons
 - Water treatment plants operations
 - Water into storage
 - Blending
 - Compliance with drinking water regulations

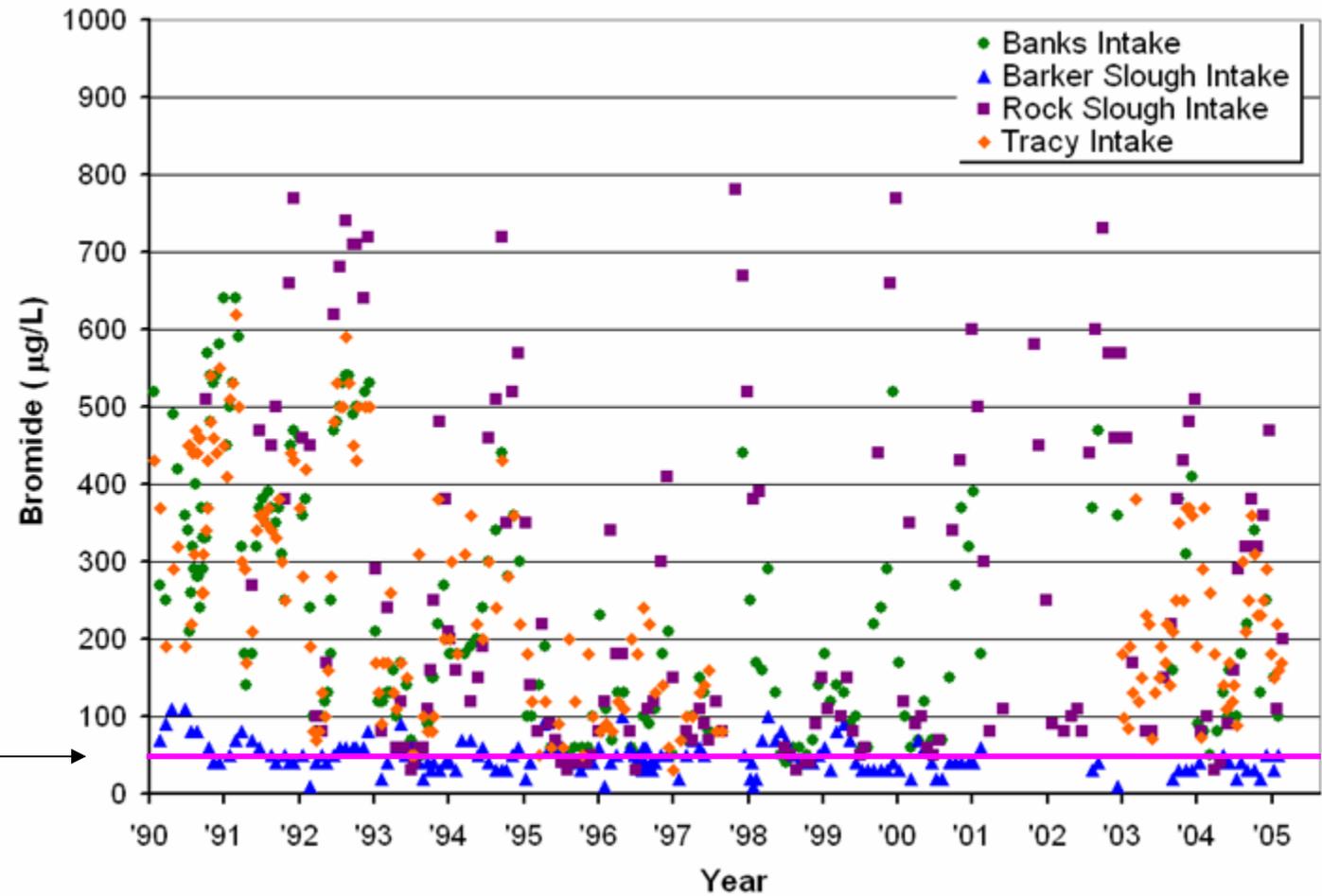




Bromide Seasonality



Seasonal fluctuations in Delta bromide at Intakes (time series)



ROD Target

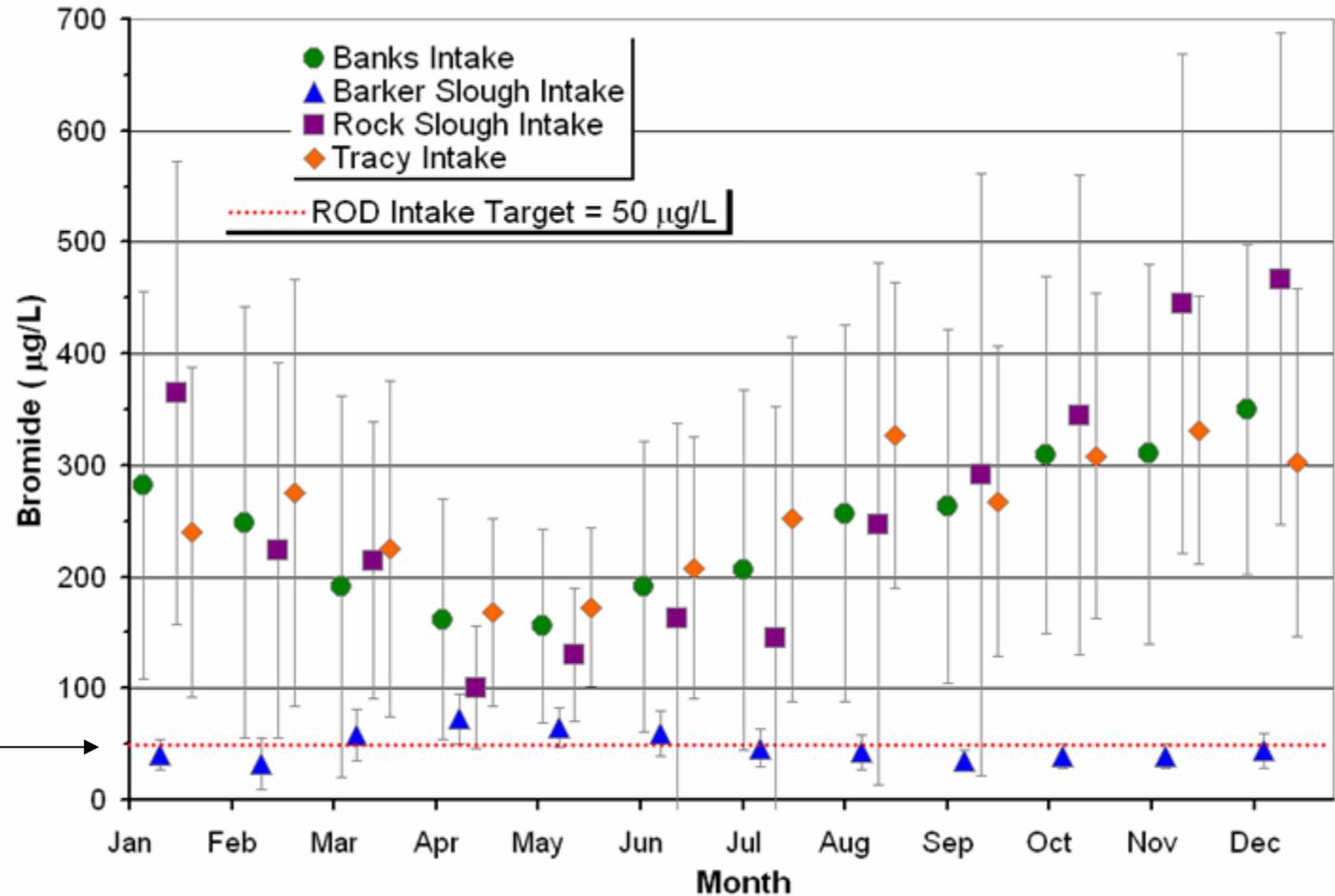




Bromide Seasonality



Seasonal fluctuations in Delta bromide at Intakes (monthly)



ROD Target →



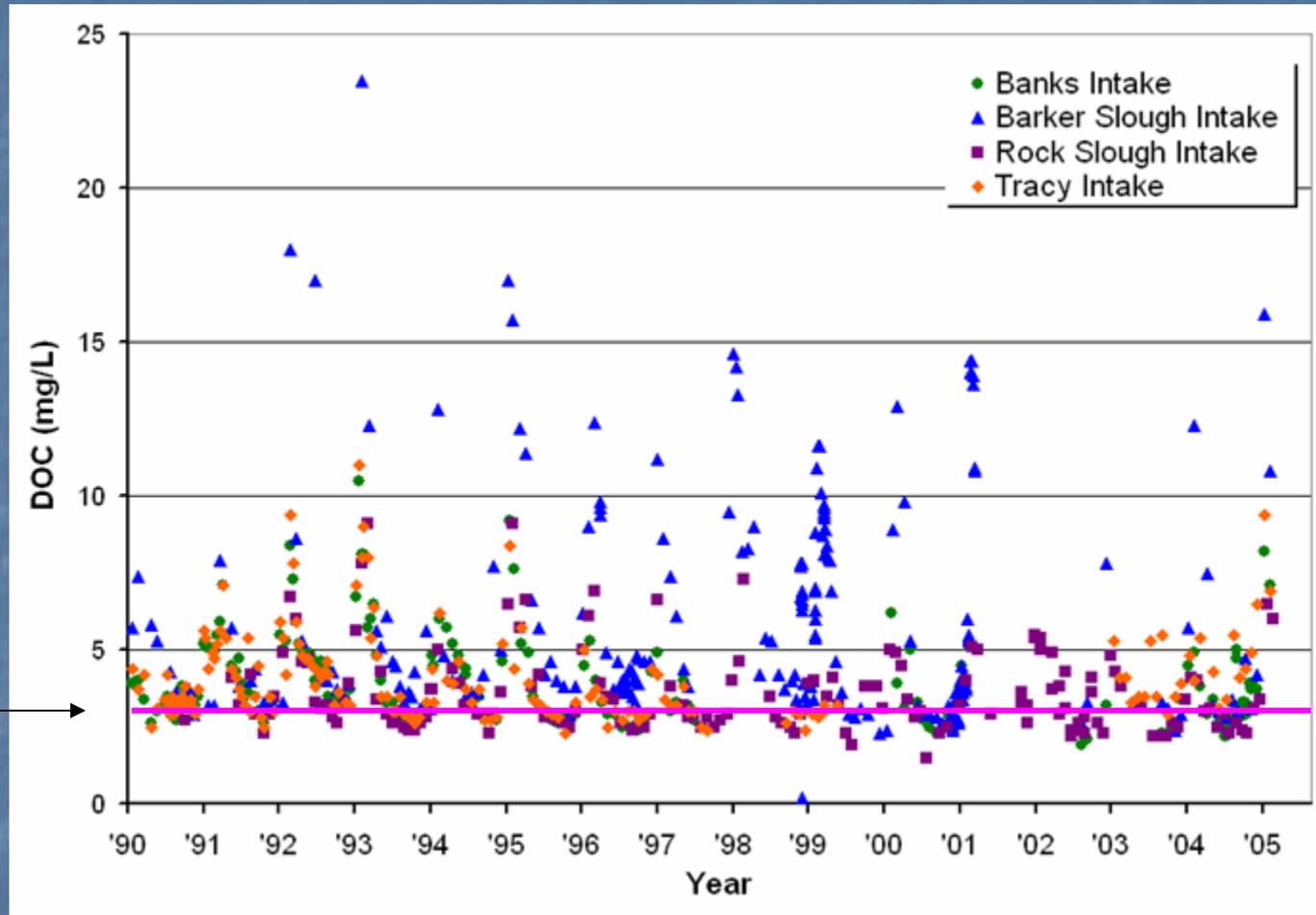


Organic Carbon Seasonality



Seasonal fluctuations in Delta DOC at Intakes (time series)

ROD Target →



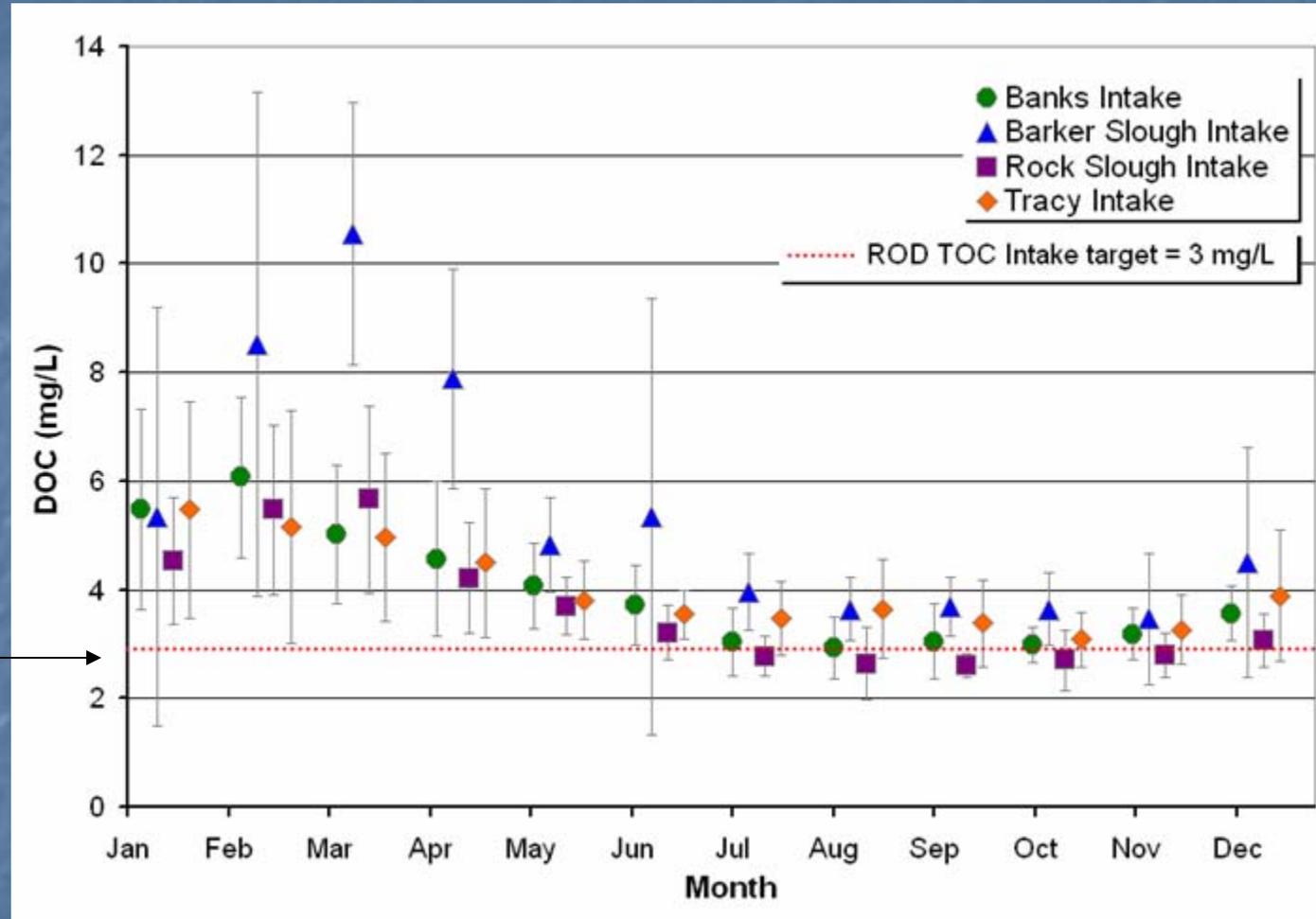


Organic Carbon Seasonality



Seasonal fluctuations in Delta DOC at Intakes (monthly)

ROD Target →





How should we evaluate and compare drinking water benefits of proposed projects?





No Single Metric Captures It All



- Different agencies, different concerns
- Seasonality issues
- Annual loading is not a useful measure





No Single Metric Captures It All



Different agencies, different concerns

- Caused by differences in:
 - conveyance & storage systems
 - operations
 - treatment practices
 - customer expectations
- Potential beneficiaries will make their own evaluations





No Single Metric Captures It All



Seasonality issues

- seasonal patterns vary by constituent
- seasonal concerns vary by agency
- seasonal patterns vary by year type





No Single Metric Captures It All



Annual loading is not a useful measure

- Water treatment occurs in real time – daily and seasonal variations matter
- Compliance with regulations is not based on annual loading
- Loading calculations presuppose operations





Common Results Presentation Allows Project Comparisons



- Plots of long-term monthly averages
- Daily time series plots
- Raw modeling results available for agency review





Common Results Presentation Allows Project Comparisons



- Plots of long-term monthly averages
 - Model results for base & with-project cases
 - EC and TOC
 - At drinking water intakes:
 - Tracy PP
 - Banks PP
 - Old River at Highway 4
 - Rock Slough Intake
 - Victoria Canal at CCWD's proposed AIP site
 - proposed Stockton intake
 - 16 year averages, wet year averages, dry year averages

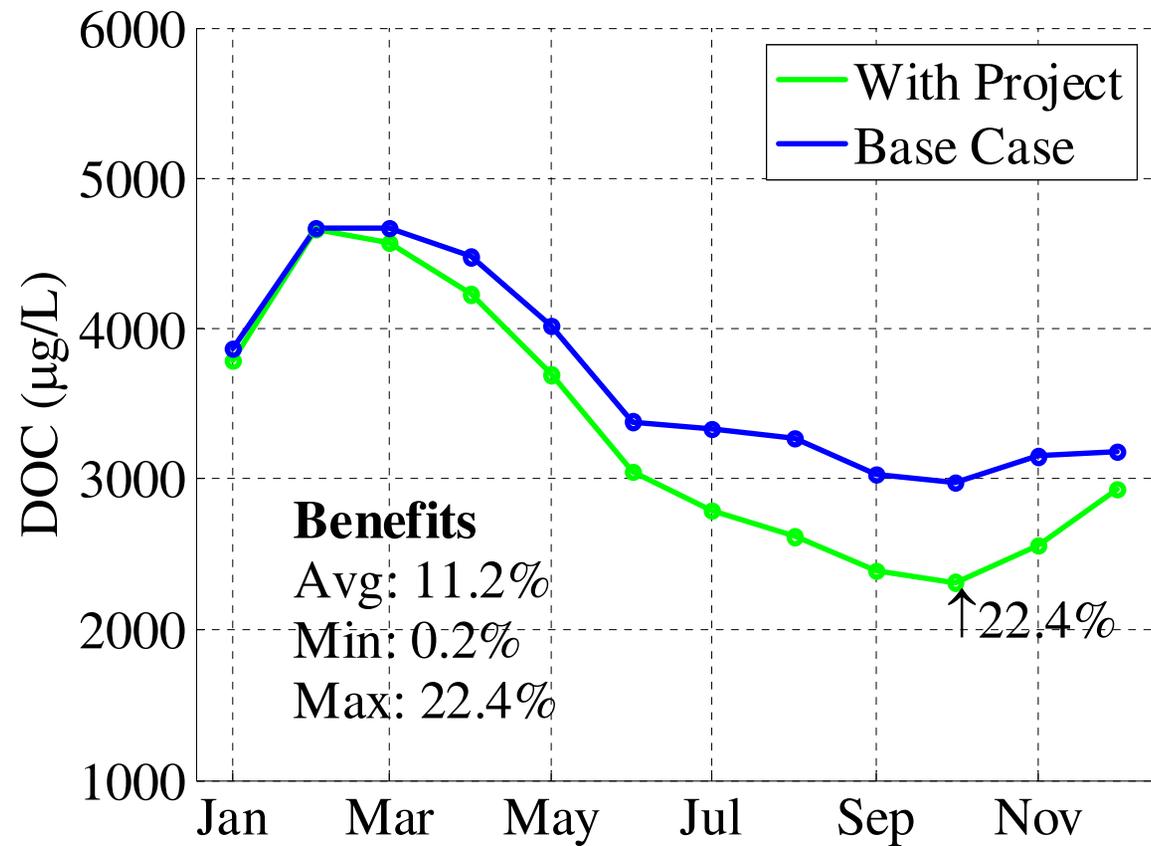




Example Long Term Average Plot



Hypothetical Project,
Old River at Hwy 4



temp.m
21-Jul-2005 Iso





Common Results Presentation Allows Project Comparisons



- Daily time series plots
 - for ec and doc
 - at the drinking water intakes
 - base case and with project case
 - differences

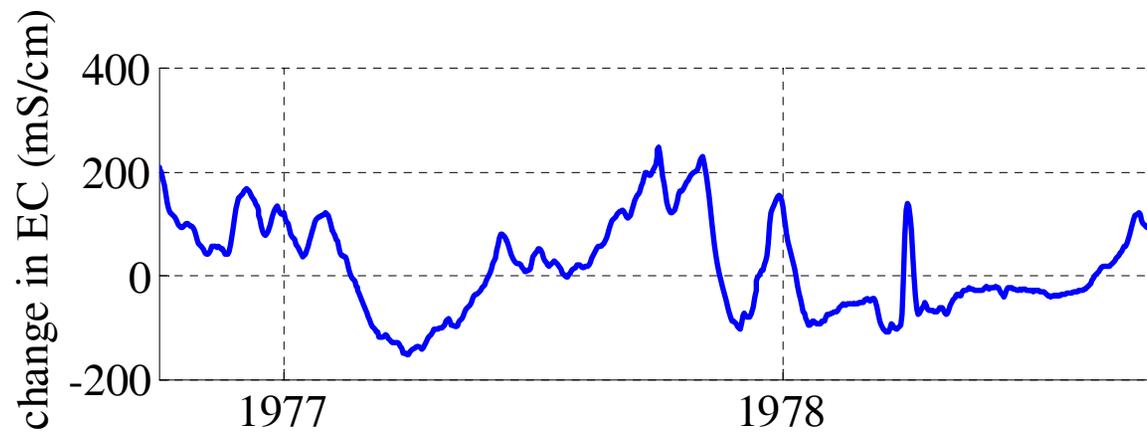
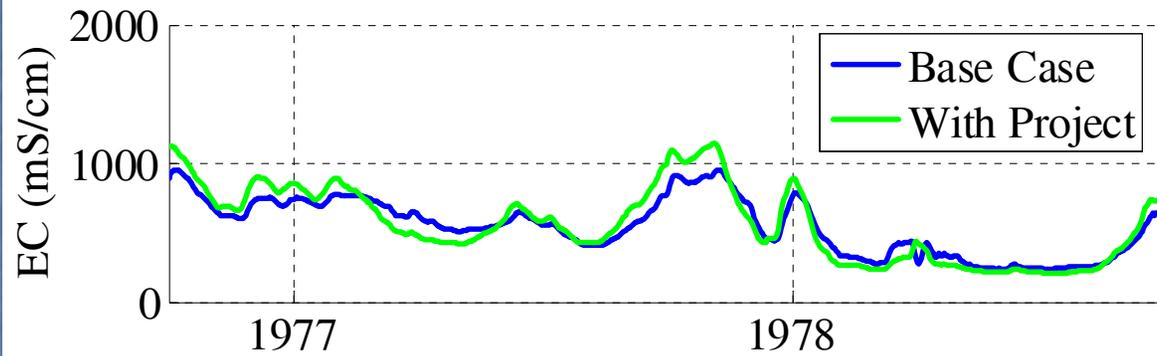




Example Daily Plots



Hypothetical Project,
Old River at
Hwy 4



temp.m
21-Jul-2005 Iso





Common Results Presentation Allows Project Comparisons



- Make raw modeling results available for agency review
 - Potential beneficiaries will make in-house evaluations





A Note of Caution



- Feasibility study water quality modeling will give an indication of **potential** for water quality improvement.
- Project operations studies will be needed to define operations criteria necessary to preserve water quality benefits.

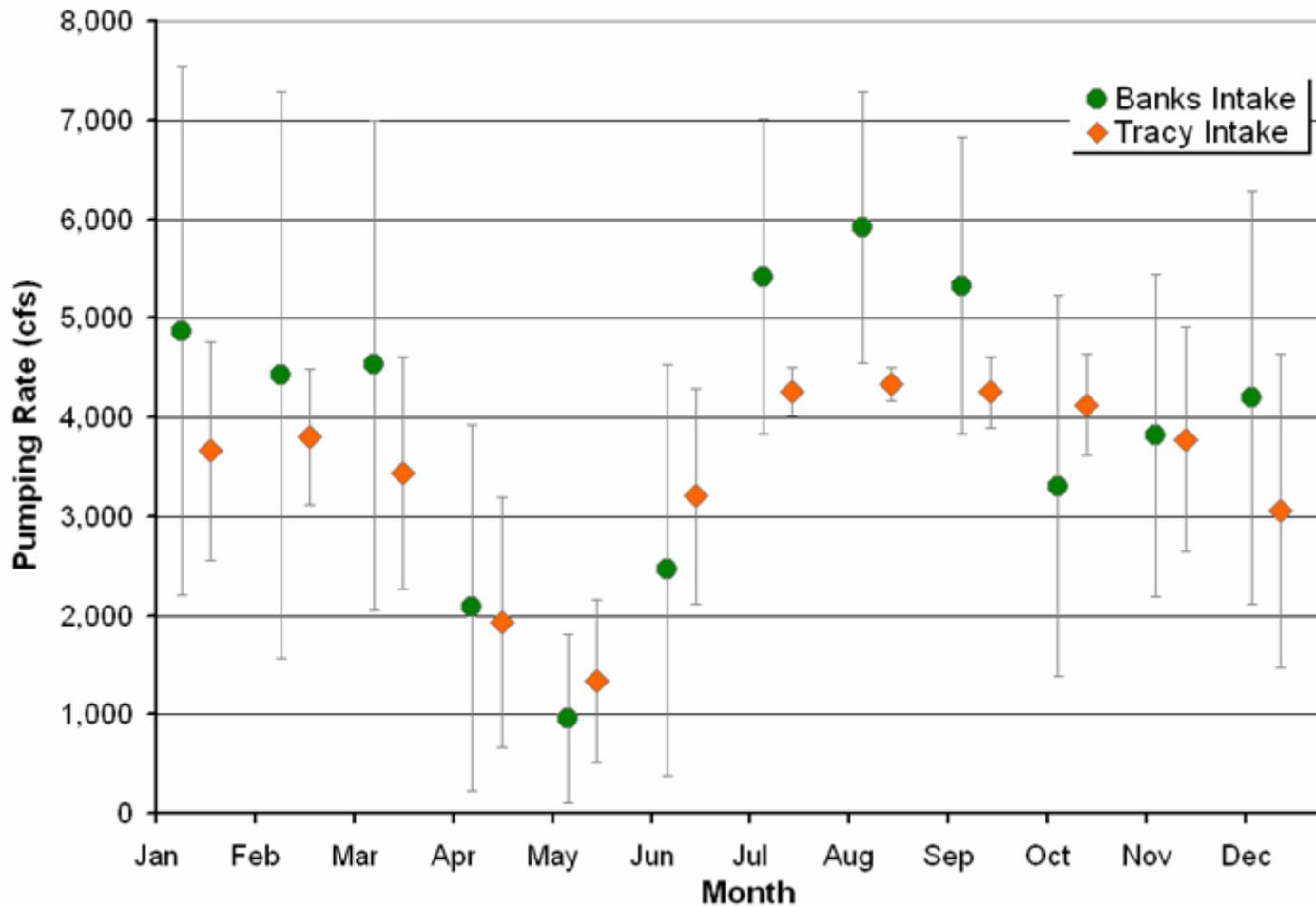




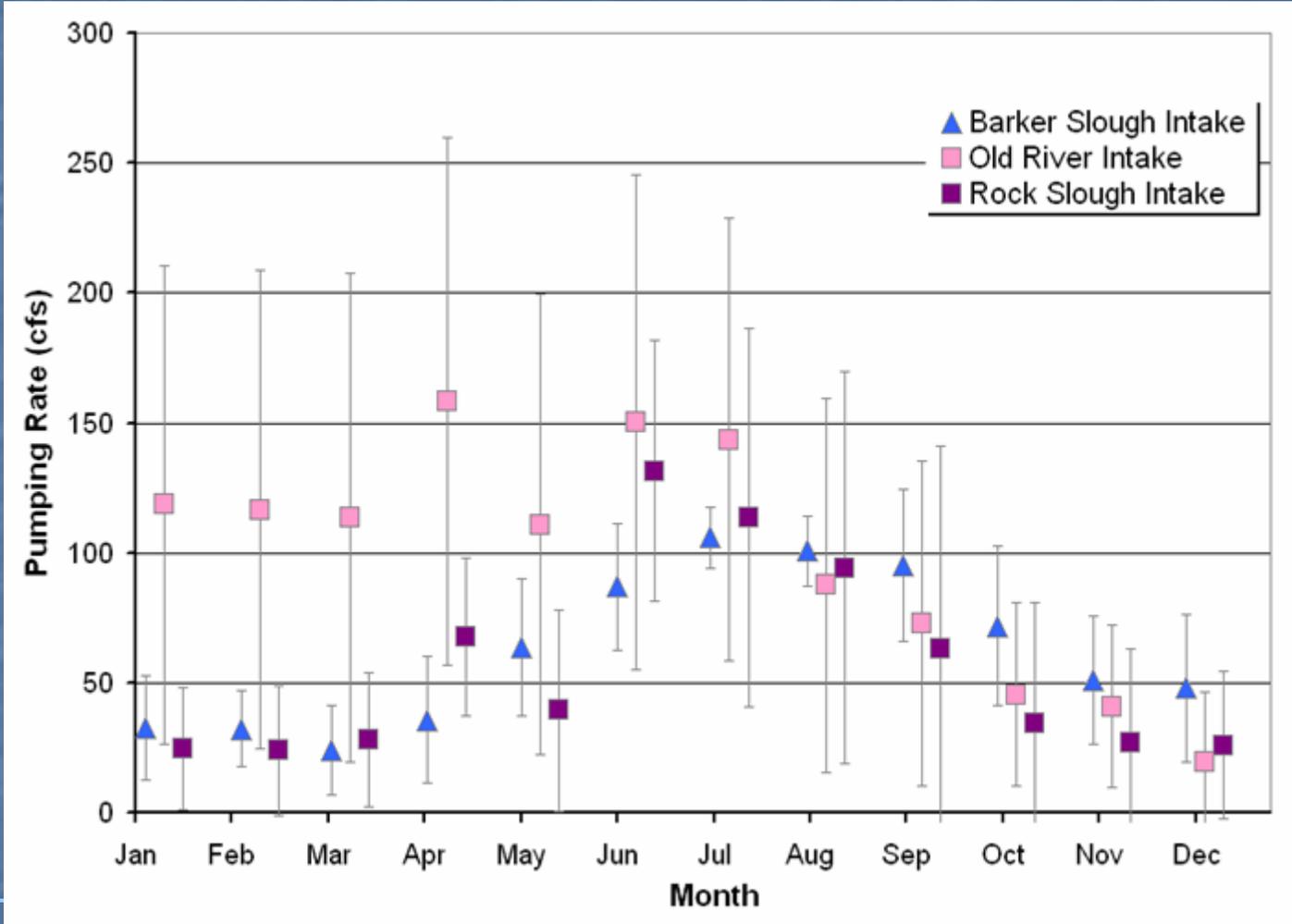
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Pumping Patterns

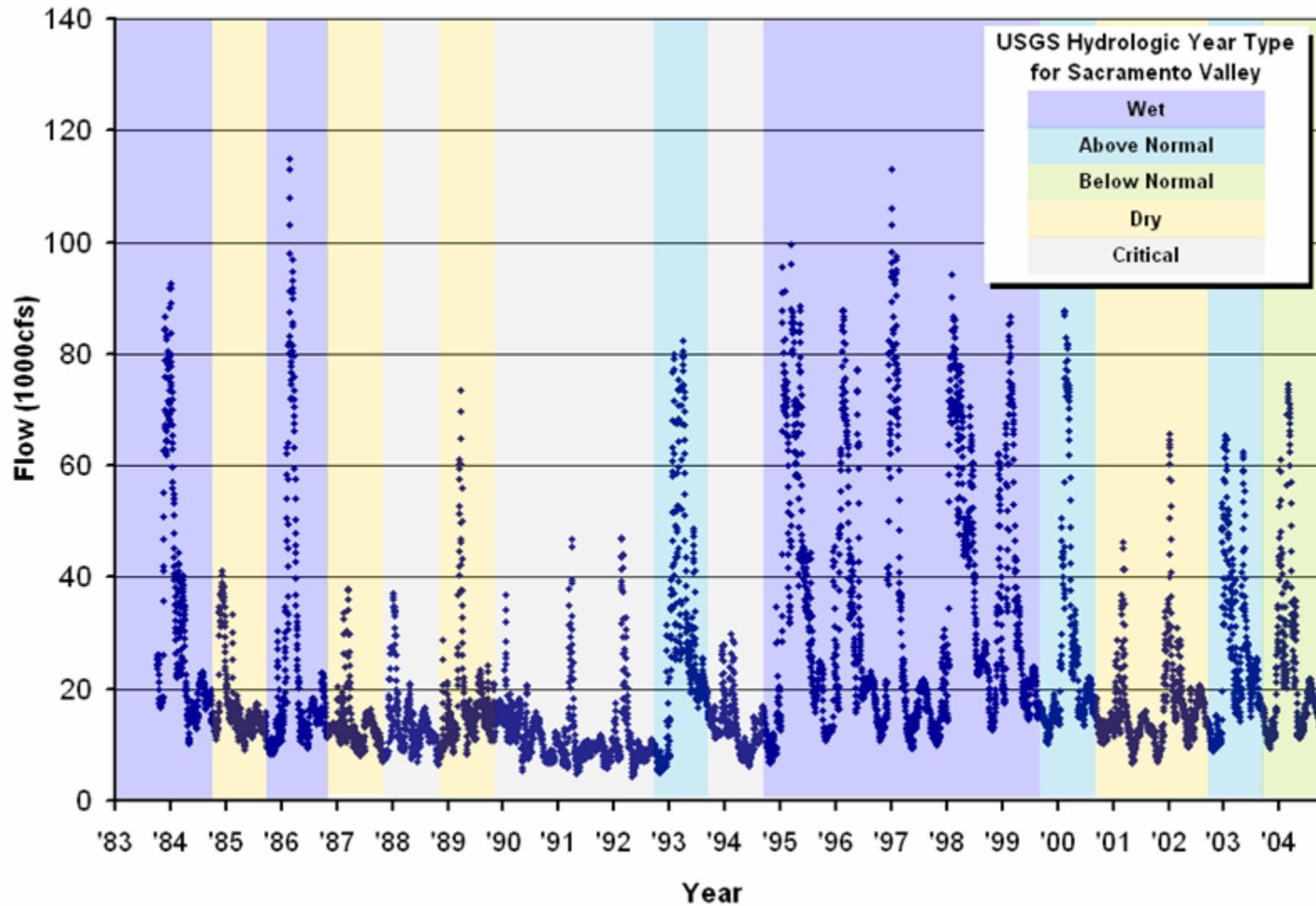


Pumping Patterns



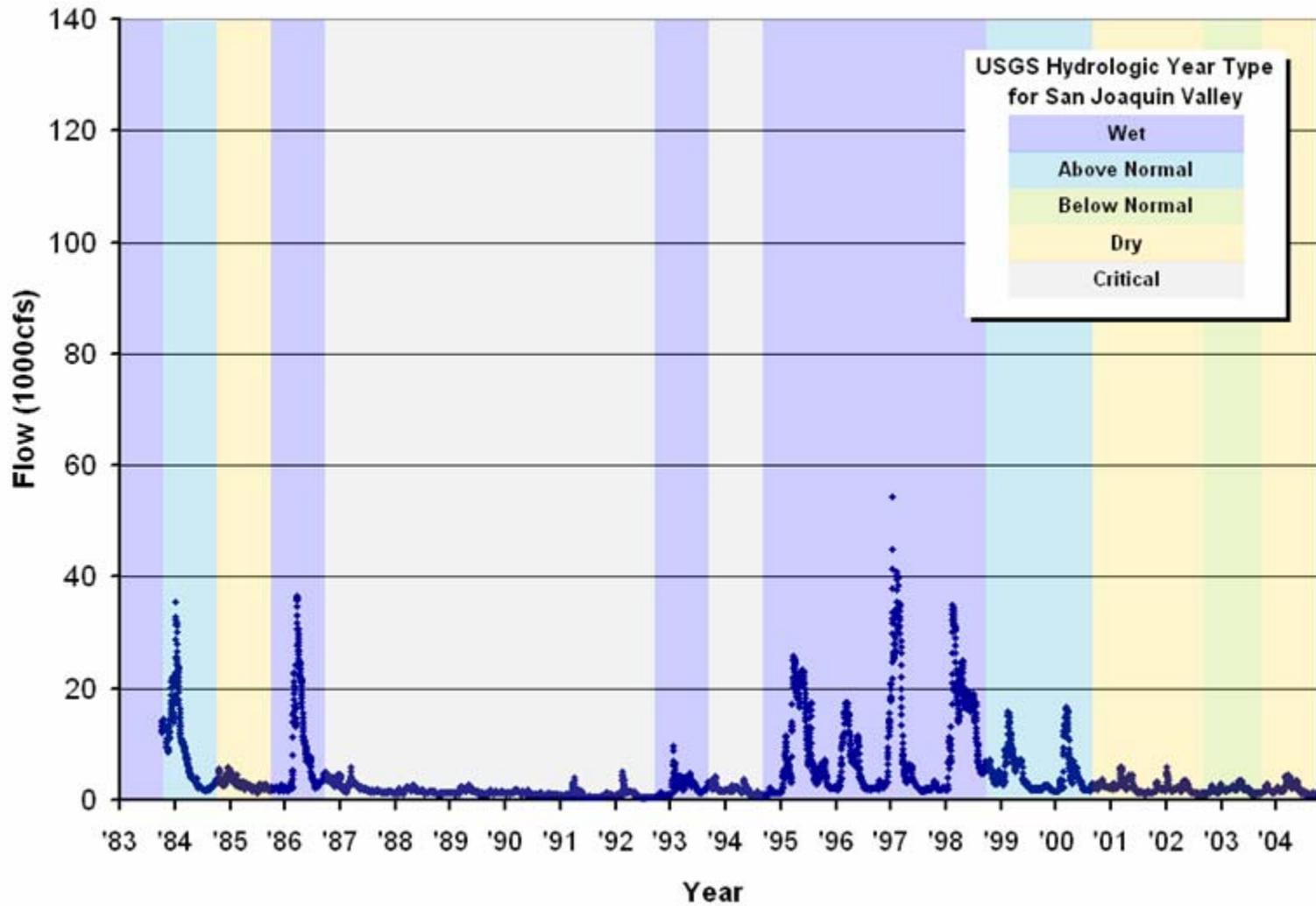


Sacramento River Flows





San Joaquin Flows



Delta Outflow

